WE CLAIM:

1. A robotic system comprising a master end and a slave end with an electronic interface located between said master end and said slave end, said slave end being physically controllable for several physical movements by physical movements at said master end, said master end and said slave end each having at least four degrees of freedom, said slave end having force measurement elements for each of said at least four degrees of freedom, said force measurement elements on said slave end being constructed to provide signals to said master end, said master end being constructed to receive said signals from said slave end and to emulate each force applied at said slave end at said master end, said interface passing signals between said master end and said slave end.

2. A robotic system as claimed in Claim 1 wherein said interface is one or more computers, said slave end being a simulation program on at least one of said one or more computers.

3. A robotic system as claimed in Claim 1 wherein said interface is a computer located at the master end and a computer located at the slave end, said computers being remote from one another.

4. A robotic system as claimed in Claim 1 wherein said interface is a computer located at said master end and a computer located at said slave end, said master end and said slave end being remote from one another.

5. A robotic system as claimed in any one of Claims 1, 2 or 3 wherein at least three physical movements at said master end correspond to at least three physical movements respectively at said slave end.

6. A robotic system as claimed in Claim 1 wherein there are at least five degrees of freedom of said at least four degrees of freedom, there being one degree of freedom for each physical movement at said master end and each corresponding physical movement at said slave end.

7. A robotic system as claimed in Claim 1 wherein said interface has a first haptic device at said master end and a second haptic device at said slave end, said first and second haptic devices being interconnected through said interface to transmit physical movements at said master end to said slave end and vice-versa.

8. A robotic system as claimed in Claim 1 wherein physical movements at said master end are transmitted to said slave end electronically and a force of each physical movement at said slave end is fed back to said master end.

9. A robotic system as claimed in Claim 1 wherein said interface is one or more computers, said slave end being a simulation program on at least one of said one or more computers.

10. A robotic system as claimed in Claim 1 wherein said slave end is constructed to receive signals from said master end and said master end is constructed to provide signals to said slave end.

11. a robotic system as claimed in Claim 10 wherein said master end and said slave end are remote from one another, said slave end being constructed to repeat physical movements at said master end and to provide force feedback to said master end for said physical movements.

12. A robotic system as claimed in Claim 10 wherein said master end is constructed to impart a roll to said slave end, said slave end having a force measurement element for said roll at said slave end, said force measurement element being constructed to provide a signal to said master end, said master end being constructed to emulate at said master end a force applied to said roll at said slave end.

13. A robotic system as claimed in Claim 12 wherein a force feedback for said roll is measured at said master end by a pre-tensioned cable having two ends pinned to a disk at one location along a

circumference of said disk, said ends extending around said disk in opposite directions with a motor to impart a roll motion to said disk in response to a signal from said slave end.

14. A robotic system comprising a master end and a slave end with an electronic interface located between said master end and said slave end, said slave end being physically controllable for at least one physical movement by at least one physical movement at said master end, said master end and said slave end each having at least one degree of freedom, said at least one degree of freedom being a roll, said slave end having a force measurement element for said roll at said slave end, said force measurement element being constructed to provide a signal to said master end, said master end being constructed to receive said signal from said slave end and to emulate at said master end a force applied to said roll at said slave end.

15. A robotic system comprising a master end and a slave end with an interface between said master end and said slave end, said slave end being physically controllable for at least one physical movement by at least one physical movement at said master end, said master end and said slave end each having at least one degree of freedom, said at least one degree of freedom being an opening and closing movement of a free end element at said slave end, said slave end having a force measurement element for said movement of said free end element, said force measurement element being constructed to provide a signal to said master end, said master end being constructed to receive said signal from said slave end and to emulate at said master end each force applied to said free end element at said slave end.

16. A robotic system as claimed in Claim 6 wherein said physical movements are pitch, yaw, insertion and removal, roll and movement of a free end element on said slave end.

17. A minimally invasive surgical device, said device comprising a master end and a slave end with an electronic interface between said master end and said slave end, said slave end being physically controllable for several physical movements by physical movements initiated at said master end, said master end and said slave end each having at least four degrees of freedom, said slave end having force measurement elements for each physical movement, part of said slave end being shaped to be inserted into a patient through a small incision, said force measurement elements on said slave end being constructed to provide signals to said master end, said master end being constructed to receive said signals from said slave end and to emulate each force applied to said slave end at said master end, said interface passing signals between said master end and said slave end.

18. A minimally invasive surgical device as claimed in Claim 17 wherein said interface is one or more computers, there being a simulation program on at least one of said one or more computers.

19. A minimally invasive surgical device as claimed in Claim 17 wherein said interface is a computer located at said master end and a computer located at said slave end, said computers being remote from one another and being capable of passing signals between one another.

20. A minimally invasive surgical device as claimed in Claim 17 wherein one of said physical movements is a roll and there is force feedback from said slave end to said master end for said roll.

21. A minimally invasive surgical device as claimed in Claim 17 wherein part of said slave end is shaped to be inserted into a patient through a small incision.

22. A minimally invasive surgical device as claimed in Claim 17 wherein said slave end has a laparoscopic member, said laparoscopic member having a free end element located at an outer end thereof, said free end element being movable in one of said physical movements, said free end element being constructed to provide force feedback to said master end for movement of said free end element.

23. A minimally invasive surgical device as claimed in Claim 17 wherein part of said slave end is shaped to be inserted into a patient through a small incision, said part having a diameter not exceeding substantially 10 millimetres.

24. A minimally invasive surgical device as claimed in Claim 17 wherein said slave end has an endoscopic member, said endoscopic member having a free end element located at an outer end thereof, said free end element being movable in one of said physical movements, said free end element being constructed to provide force feedback to said master end for movement of said free end element, there being strain gauges on a support for said free end element, said support being remote from said free end element.

25. A minimally invasive surgical device as claimed in Claim 24 wherein said endoscopic member is comprised of three concentrally mounted tubes, said tubes being movable longitudinally relative to one another, there being an outer tube, an inner tube and a middle tube, said middle tube being connected to a base of said free element and said inner tube being connected to a movable portion of said free end element so that said free element can move between an open position and a closed

position by linear movement of said inner tube relative to said middle tube.

26. A minimally invasive surgical device as claimed in Claim 24 wherein said free end element is selected from the group of a grasper, a scissors and a dissector or other cutting, grasping or dissecting means, a movement of said free end element being in a non-linear direction relative to said tubes.

27. A minimally invasive surgical device as claimed in Claim 26 wherein there is a load cell mounted between an inner end of said inner tube and a motor to measure operational forces on said free end element.

28. A minimally invasive surgical device as claimed in Claim 27 wherein compression/tensional axial forces on said free end element are measured by strain gauges on a link between said endoscopic instrument and said haptic device.

29. A minimally invasive surgical device as claimed in Claim 28 wherein lateral forces on said free end element are measured by strain gauges located on opposite sides of said inner tube remote from said free end element.

30. A minimally invasive surgical device as claimed in Claim 29 are measured by a strain gauge placed on said middle tube remote from said free end element.

31. A minimally invasive surgical device as claimed in Claim 29 wherein said link between said endoscopic instrument and said haptic device has two arcuate arms that are pivotally mounted relative to one another with a brace extending upward from a lower end of one said arcuate arms, said brace supporting an inner end of said endoscopic instrument and containing strain gauges to measure axial forces on said free end element.

32. A minimally invasive surgical device as claimed in Claim 17 wherein said slave end is constructed to receive signals from said master end and said master end is constructed to provide signals to said slave end.

33. A minimally invasive surgical devices as claimed in Claim 32 wherein said master end and said slave end are remote from one another, said slave end being constructed to repeat physical movements at said master end and to provide force feedback to said master end for said physical movements.

34. A minimally invasive surgical device as claimed in Claim 32 wherein said master end is constructed to impart a roll to said slave end, said slave end having a force measurement element for said roll at said slave end, said force measurement element being constructed to provide a signal to said master end, said master end being constructed to emulate at said master end a force applied to said roll at said slave end.

35. A minimally invasive surgical device as claimed in Claim 34 wherein a force feedback for said roll is measured at said master end by a pre-tensioned cable having two ends pinned to a disk at one location along a circumference of said disk, said ends extending around said disk in opposite directions with a motor to impart a roll motion to said disk in response to a signal from said slave end.

36. A minimally invasive surgical device comprising a master end and a slave end with an interface located between said master end and said slave end, said slave end being physically controllable for at least one physical movement by at least one physical movement at said master end, said master end and said slave end each having at least one degree of freedom, said at least one degree of freedom being a roll, said slave end having a force measurement element for said roll at said slave end,

said force measurement element being constructed to provide a signal to said master end, said master end being constructed to receive said signal from slave end and to emulate at said master end each force applied to said roll at said slave end.

37. A minimally invasive surgical device comprising a master end and a slave end with an interface located between said master end and said slave end, said slave end being physically controllable for at least one physical movement by at least one physical movement at said master end, said master end and said slave end each having at least one degree of freedom, said at least one degree of freedom being an opening and closing of a free end element at said slave end, said slave end having a force measurement element for said opening and closing at said slave end, said force measurement element being constructed to provide a signal to said master end, said master end being constructed to receive said signal from said slave end and to emulate at said master end each force applied to said free end element at said slave end.

38. A method of operating a robotic system having a master end and a slave end with an electronic interface therebetween, said slave end being physically controllable for several physical movements by physical movements at said master end, said master end and said slave end each having at least four degrees of freedom, said slave end having force measurement elements thereon for each of said at least four degrees of freedom, said force measurement elements on said slave end being constructed to provide signals to said master end, said master end being constructed to receive said signals from said slave end and to emulate each force applied at said slave end at said master end, said interface passing signals between said master end and said slave end, said method comprising physically moving said master end through said at least four

degrees of freedom to cause said slave end to physically move through said at least four degrees of freedom, detecting force feedback at said master end from signals generated from each physical movement at said slave end.

39. A method as claimed in Claim 38 including the step of passing signals from said master end to said slave end to cause said slave end to repeat physical movements from said master end at said slave end.

40. A method as claimed in Claim 39 including the step of using motors and encoders to receive said force feedback at said master end.